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EXAMINER	
SINGH, SATYENDRA K	
ART UNIT	**PAPER NUMBER**
1651	

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/673,110	NELSON ET AL.	
	Examiner	Art Unit	
	Satyendra K. Singh	1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 April 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *4-6,20-34 and 36-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,7-19 and 35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 October 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *08/02/01; 11/07/01*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Applicant's election of Group I (claims 1-3, 7-19, and 35), without traverse, in response (dated June 22, 2005) to the restriction election requirement made is acknowledged.

The inventions of Group I (claims 1-3, 7-19, and 35) are examined hereafter.

Claims 4-6, 20-34 and 36-38 are withdrawn from further consideration.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term "**cofactor**" in claim 3 is used by the claim to mean "substrate", while the accepted meaning is "**thermostable nonprotein component.**" The term is indefinite because the specification does not clearly redefine the term.

Claim recite the term "**cofactor**" which is used in the compositions as claimed when the composition comprises a phenol oxidase and a phenol hydroxylase, which is unclear for the following reasons. The instant specification does not provide any specific definition or guidance and merely mentions that a cofactor may comprise a phenolic moiety with monohydroxy- or dihydroxy phenol group that are oxidized (inter- or intra-molecular) by phenol oxidase-catalyzed reactions in order to yield a quinine group (see page 9, last paragraph, in particular).

The general meaning of the term "cofactor" is "a substance that acts with another substance to bring about certain effects; especially: coenzyme which is defined as **a thermostable nonprotein component that forms the active portion of an enzyme system after combination with an apoenzyme**" (see prior art [U], Merriam-Webster online dictionary). Therefore, use of term "cofactor" in place of a substrate such as catechol or catechin (for the enzyme tyrosinase used in the instant invention) is confusing. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 7-8, 11, 16, 17, 19 and 35 are rejected under 35 U.S.C. 102(b) as being anticipated by Benedict et al (document EP 0244,688 A2; IDS) as supported by Longa et al [V] and Pierce Biotechnology Inc. [W].

Claim 1 is drawn to "**a composition** for use as an adhesive comprising: **an extensin protein**; and either a **non-enzymatic bifunctional crosslinking agent**; or a **phenol oxidase and a phenol hydroxylase**".

The instant specification (see page 5, last paragraph, in particular) defines "**extensin protein** as covering: extensin **derivatives** (whether chemical or synthetic) which have amino acid sequences which differ from the extensin sequences by virtue of amino acid substitution, deletion, or addition, protease truncation or post translational modification; but which retain extensin activity"

Per MPEP 2111.01, in the absence of any specific definition provided in the instant specification the examiner must give broadest reasonable interpretation to all the terms in the claims (*During patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." In re Hyatt, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000);* and *It is only when the specification provides definitions for terms appearing in the claims that the specification can be used in interpreting claim language. In re Vogel, 422 F.2d 438, 441, 164 USPQ 619, 622 (CCPA 1970).*

The term "**derivative**" means (see prior art [U], Online Merriam-Webster dictionary) "something derived or a chemical substance related structurally to another substance and **theoretically derivable from it** or a substance that can be made from

another substance", and is in agreement with the definition provided for "extensin derivative" in the instant specification. Therefore, a substrate derived from extensin protein such as claimed, may constitute extensin protein itself or fragments thereof (individual or combinations thereof) isolated actually or theoretically from extensin protein such as various peptides, homologs, variants, etc.

Benedict et al (IDS) teach an adhesive composition derived from bioadhesive polyphenolic proteins (that have the same consensus sequence as disclosed in the instant specification; see sequence listing of the decapeptide, AKPSYPPTYK; submitted on May 17, 2002) when the amino acid substitutions of serine, tyrosine, and proline (with threonine, DOPA, and hydroxyproline, respectively) are considered in light of the disclosure provided by the applicants (see prior art, abstract, page 1, in particular).

The compositions useful in biomedical applications as taught by Benedict et al (IDS) comprises of the protein or decapeptides derived from extensin protein (as discussed, supra) and either a non-enzymatic bifunctional crosslinking agent (as exemplified by the instant specification; see page 8, first paragraph, in particular) such as glutaraldehyde (see Benedict et al, page 7, in particular) or a homobifunctional cross linker such as 3,3'-dithiobis (sulfosuccinimidylpropionate, DTSSP; as evidenced by Pierce Biotechnology Inc. [W]) (see Benedict et al, page 25 and 26, example 12, in particular), or a phenol oxidase and a phenol hydroxylase (as exemplified in the instant specification, page 7, last paragraph, in particular) such as a mushroom tyrosinase (see Benedict et al, page 7 in particular).

Claim 2 is drawn to "a composition for use as an adhesive comprising: an extensin protein; a non-enzymatic bifunctional crosslinking agent; and a phenol oxidase and a phenol hydroxylase".

As discussed (supra), Benedict et al (IDS) teach such a composition as claimed wherein the composition comprises of bioadhesive polyphenolic proteins (i.e. extensin protein derived decapeptides); a non-enzymatic bifunctional crosslinking agent (as exemplified by the instant specification; see page 8, first paragraph, in particular) such as glutaraldehyde (see Benedict et al, page 7, in particular), or a homobifunctional cross linker such as 3,3'-dithiobis (sulfosuccinimidylpropionate; DTSSP) (see Benedict et al, page 25 and 26, example 12, in particular), and a phenol oxidase and a phenol hydroxylase (as exemplified in the instant specification, page 7, last paragraph, in particular) such as a mushroom tyrosinase (see Benedict et al, page 7 in particular).

Claim 3 is drawn to "a composition according to claim 1 or 2 which further comprises a **cofactor** when the composition comprises a phenol oxidase and a phenol hydroxylase".

In the absence of any specific definition or guidance provided in the instant specification, and in light of the broadest reasonable interpretation of the term "cofactor" as recited in the claim 3 means "a substance that acts with another substance to bring about certain effects; especially: coenzyme which is defined as **a thermostable nonprotein component that forms the active portion of an enzyme system after combination with an apoenzyme**" (see prior art [U], Merriam-Webster online

dictionary) which is also consistent with the exemplification provided in the instant invention (using a cofactor comprising a phenolic moiety such as a quinone; see page 9, last paragraph, in particular), the term "cofactor" is thus deemed to mean a thermostable nonprotein component (including a metal ion) that forms the active portion of an enzyme system (such as a mushroom tyrosinase in the instant case as clearly described and disclosed by Longa et al [V] in the biochemical characterization of a commercially available *Agaricus bisporus* tyrosinase; see introduction, first paragraph, in particular) after combination with an apoenzyme.

Benedict et al (IDS) teach a composition according to claim 1 or 2, further comprising a cofactor such as a **metal ion** (added in the form of electrically conductive substrates, such as cuprous- and cupric sulfate salts; see Benedict et al, page 8, first paragraph; and page 15, use no. 12, in particular) when the composition (such as an electrically conductive adhesive) comprises a phenol oxidase and a phenol hydroxylase such as a mushroom tyrosinase (see also discussion, supra).

Claims 7 and 8 are drawn to "a composition according to claim 3 in which the **cofactor** comprises **a phenolic moiety** which comprises at least one of a monohydroxy phenol group or a dihydroxy phenol group; and in which the cofactor is **soluble in water**".

Benedict et al (IDS) disclose such a composition (see discussion, supra) wherein the cofactor (i.e. the tyrosine residues in the polyphenolic protein) comprising a monohydroxy- or a dihydroxy phenol group is explicitly taught (see Benedict et al,

abstract, in particular) when the X in the decapeptide disclosed is hydroxyl group(s). The limitation of a "cofactor which is soluble in water" is met by Benedict et al (IDS) as it explicitly teaches such an **aqueous composition** comprising polyphenolic protein (see abstract, in particular) along with a non-enzymatic bifunctional crosslinking agent such as DTSSP, and a mushroom tyrosinase (see also discussion, supra).

Claims 11 and 16-17 recite compositions (according to claims 1 or 2) in which the non-enzymatic bifunctional crosslinking agent comprises glutaraldehyde; and in which the phenol oxidase and the phenol hydroxylase is a tyrosinase (a mushroom tyrosinase), the limitations of which are anticipated by Benedict et al (IDS; see discussion, supra).

Claim 19 is drawn to "a composition for use as an adhesive which comprises: an extensin protein; a cofactor comprising a dihydroxyphenol group; a phenol oxidase and optionally a non-enzymatic bifunctional crosslinking agent".

Benedict et al (IDS) teach such a composition for use as an adhesive which comprise a polyphenolic protein; containing repeating decapeptides (as disclosed by Benedict et al) that have multiple tyrosine/DOPA (3,4-dihydroxyphenyl a-alanine) residues that can act as substrates (cofactor- see discussion, supra; also as disclosed on page 1 of the instant specification); a catechol oxidase (also known as a mushroom tyrosinase) (see page 7, in particular) as an enzymatic oxidizing agent; and optionally a

non-enzymatic bifunctional crosslinking agent such as glutaraldehyde or DTSSP (see page 25 and 26, in particular; also as discussed, supra).

Claim 35 is drawn to "a **pharmaceutical composition** comprising a pharmaceutically active ingredient and a crosslinked adhesive composition according to any of claim 1, 2, or 19".

Benedict et al (IDS) teach a pharmaceutical composition for biomedical uses comprising a pharmaceutically active ingredient such as implant drugs, hormones, biological factors, medicines, tissues, cells, etc. (see page 9, last paragraph; see also specific uses, pages 10-14, and 16-17, and examples, in particular) and a crosslinked adhesive composition such as containing bioadhesive polyphenolic protein, and/or a bifunctional crosslinking agent, and a mushroom tyrosinase such as claimed in claims 1, 2 or 19 (see page 17, second paragraph, in particular; and also discussion, supra).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 9, 10 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al (IDS, EP 0244,688 A2) as supported by Longa et al [V] and Pierce Biotechnology Inc. [W] as applied to claims 1-3, 7-8, 11, 16-17, 19, and 35 above, and in view of Negishi et al (U.S. Patent 5,804,170 [A]) as supported by Yamamoto et al (IDS).

Claims 7-10 are drawn to a composition according to claim 3 in which the **cofactor** comprises a **phenolic moiety** which comprises at least one of a monohydroxy phenol group or a dihydroxy phenol group; in which the **cofactor is soluble in water**, in which the cofactor comprises **catechin**; and in which the cofactor comprises **catechol**. Claim 18 is drawn to a composition according to claim 17 in which the mushroom tyrosinase is ***Agaricus bisporus*** tyrosinase.

The teachings of Benedict et al (IDS) have been discussed (supra) and are relied upon in the same manner.

Benedict et al (IDS) teach a composition such as claimed comprising water-soluble polyphenolic protein (or its derivatives; see discussion, supra), wherein the amino acids such as tyrosine/DOPA can be substituted to have mono or dihydroxyphenol groups and thus will act as internal cofactors (as substrate, see discussion, supra) as claimed in claim 3 for the polyphenol oxidase present in the composition as taught.

However, an adhesive composition further comprising (see discussion, supra) a water-soluble cofactor containing mono- or dihydroxy phenolic moiety comprising catechin, or catechol is not explicitly disclosed by Benedict et al (IDS).

Negishi et al [A] teach a deodorant composition comprising a phenolic compound and an enzyme oxidizing said phenolic compound (see Negishi et al, abstract, summary of the invention, column 1-2, table 1-2, in particular). The composition as taught by Negishi et al [A] comprises a mushroom tyrosinase from *Agaricus bisporus* (see column 2, lines 44-46, in particular) (such as claimed in claim 18), and compound containing phenolic moieties (i.e. mono- or dihydroxy phenol groups) such as catechin, or catechol (see column 2, second paragraph, in particular) which are known to act as substrates (and therefore, a cofactor such as claimed in claim 3 and 7; see also discussion, supra) for the polyphenol oxidase such as mushroom tyrosinase (see column 2, fourth paragraph, in particular). Negishi et al [A] teach that the phenolic compounds are oxidized by polyphenol oxidases (i.e. tyrosinase/catechol oxidase) to yield highly reactive quinone structures that in turn react with substances causing stenches (see column 1, summary, in particular). Negishi et al further explain that under these

conditions, the auto-oxidation (catalyzed by the presence of highly reactive quinone intermediates produced by the action of tyrosinase on the phenolic compounds) would be expected to occur resulting in the removal of the stench causing organic substances (such a mechanism of action of tyrosinases or polyphenol oxidases was well established in the art at the time the invention was made, as evidenced by the disclosure in Yamamoto et al (IDS; see auto-crosslinking-induced adhesion discussed under introduction, in particular)).

Although, the composition taught by Negishi et al does not directly teach the use of such cofactors (such as catechin or catechol as claimed) with polyphenol oxidase/tyrosinase, and differs in the nature of the intended use of the composition, the fact that the basis of such composition resides in the enzymatic action tyrosinase/polyphenol oxidase on substrates such as catechin or catechol, and thereby producing reactive quinone structures which in turn react with stench producing organic substances resulting in auto-crosslinking, polymerization and thus effective removal by the phenomenon of adsorption which is explicitly disclosed by Negishi et al (see Negishi et al, entire column 1, lines 15-20, in particular).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the adhesive composition comprising polyphenolic protein (or its derivatives) and non-enzymatic bifunctional crosslinking agent (such as DTSSP) as taught by Benedict et al (IDS) such that the composition further comprises a water soluble cofactor having a phenolic moiety which is catechin or catechol, as explicitly taught by Negishi et al [A].

The person of ordinary skill in the art would have been motivated to make such modification because Negishi et al [A] teach the benefits of using phenolic compounds (such as catechin, catechol, etc.) as a substrate (or a cofactor as claimed, see also discussion, supra) to initiate the auto-oxidation process resulting from the enzymatic action of mushroom tyrosinase/polyphenol oxidase present in such a composition that in turn leads to extensive auto-crosslinking (inter- and intra-molecular) of the aromatic residues present in the polyphenolic compounds (i.e. similar to the aromatic amino acids present in the extensin or polyphenolic proteins of the compositions as claimed) which are responsible for the stench, and thus acting as an effective deodorant composition (see Negishi et al [A], column 1-2, in particular).

One of ordinary skill in the art would have had a reasonable expectation of success when modifying the composition as taught by Benedict et al (IDS) because Negishi et al [A] explicitly teach such a composition containing phenolic compounds and polyphenol oxidase such as a mushroom tyrosinase from *Agaricus bisporus* (see Negishi et al, examples and table 1-2, in particular).

Thus the invention as a whole would have been *prima facie* obvious to one skilled in the art at the time the claimed invention was made.

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al (IDS, EP 0244,688 A2) as supported by Longa et al [V] and Pierce Biotechnology Inc. [W] as applied to claims 1-3, 7-8, 11, 16-17, 19, and 35 above, and in view of Hughes et al (U.S. Patent 4,976,837 [B]).

Claims 12 and 13 (depends from claim 13) are drawn to a composition according to claim 1 or 2 in which the non-enzymatic bifunctional crosslinking agent comprises a **di-isocyanate**; and in which the di-isocyanate is **Trixene**.

The teachings of Benedict et al (IDS) have been discussed (supra) and are relied upon in the same manner.

Benedict et al (IDS) teach such compositions for use as adhesives (non-biomedical adhesive formulations such as anti-fouling, anti-corrosive, electrically conductive, primers, coatings, tapes, etc) which comprise polyphenolic protein containing repeating decapeptides (as disclosed by Benedict et al) that have multiple tyrosine/DOPA (3,4-dihydroxyphenyl a-alanine) residues that can act as substrates (cofactor- see discussion, supra; also as disclosed on page 1-2 of the instant specification, in particular); a catechol oxidase (also known as a mushroom tyrosinase) (see Benedict et al, specific uses, pages 10-17, examples, and page 7, in particular) as an enzymatic oxidizing agent; and optionally a non-enzymatic bifunctional crosslinking agent such as glutaraldehyde or DTSSP (see page 25 and 26, in particular; also as discussed, supra).

However, a composition in which the non-enzymatic bifunctional crosslinking agent comprises a **di-isocyanate,** or in which the di-isocyanate is **Trixene** is not explicitly disclosed by Benedict et al (IDS).

Hughes et al [B] teach blocked di-isocyanate compounds such as Trixene L75 (described herein as a polyfunctional isocyanate) which are useful in compositions such

as paints and elastomers, and as coating materials (see Hughes et al, abstract, column 1 and example 1, in particular). Hughes et al [B] teach the useful properties of blocked di-isocyanate derivatives in promoting polymerization by chain extension or crosslinking of active hydrogen containing compounds leading to hardening (see Hughes et al, column 1, second and third paragraphs; column 3, in particular) when present in the composition, and shows that such compositions are also compatible with other standard additives such as surface active agents, catalysts and anti-oxidants. Most importantly, these blocked di-isocyanate derivatives such as Trixene as taught by Hughes et al, can also be useful for conditional activation of crossliniking at high temperatures such as during the process of stoving wherein the paint is hardened by heating at higher temperatures such as 100°-140° C (see column 1, third paragraph; and column 4, third paragraph, in particular).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the adhesive composition comprising polyphenolic protein and a non-enzymatic bifunctional crosslinking agent as taught by Benedict et al (IDS; see also discussion, supra) such that the non-enzymatic bifunctional crosslinking agent comprises a di-isocyanate such as Trixene, as explicitly taught by Hughes et al [B].

The person of ordinary skill in the art would have been motivated to make such modification because Hughes et al [B] teach the benefits of using di-isocyanate such as Trixene in a paint composition as the blocked di-isocyanate derivatives require lower temperatures for hardening and therefore are useful for thermo-setting adhesives (as

suggested in the instant specification, page 8, first paragraph, in particular). Since the blocking groups are only removed at higher temperatures (thus providing a conditional crosslinking), the benefits of using Trixene in the composition such as taught by Benedict et al, is quite clear.

One of ordinary skill in the art would have had a reasonable expectation of success when modifying the composition as taught by Benedict et al (IDS) because Hughes et al explicitly teach preparation and use of such blocked di-isocyanate compounds and their derivatives including Trixene L75 (see Hughes et al, column 1-4 and examples, in particular) in paint and elastomers containing compositions. One of ordinary skill in the art would be obviously motivated to combine the teachings of Hughes et al to modify the adhesive composition such as taught by Benedict et al in order to obtain a superior quality (quicker and better hardening at desired temperatures, and with less toxicity associated with the di-isocyanate derived crosslinkers) of the thermo-setting compositions such as claimed.

Thus the invention as a whole would have been *prima facie* obvious to one skilled in the art at the time the claimed invention was made.

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al (IDS, EP 0244,688 A2) as supported by Longa et al [V] and Pierce Biotechnology Inc. [W] as applied to claims 1-3, 7-8, 11, 16-17, 19, and 35 above, and in view of Rae (U.S. Patent 4,038,472 [C]).

Claim 14 and 15 (depends from claim 14) are drawn to a composition of claim 1 or 2 in which the non-enzymatic bifunctional crosslinking agent comprises a **quinone** in which the quinone is a **benzoquinone**".

The teachings of Benedict et al (IDS) have been discussed (supra) and are relied upon in the same manner.

Benedict et al (IDS) teach such compositions for use as adhesives (non-biomedical adhesive formulations such as anti-fouling, anti-corrosive, electrically conductive, primers, coatings, tapes, etc) which comprise polyphenolic protein containing repeating decapeptides (as disclosed by Benedict et al) that have multiple tyrosine/DOPA (3,4-dihydroxyphenyl a-alanine) residues that can act as substrates (cofactor- see discussion, supra; also as disclosed on page 1-2 of the instant specification, in particular); a catechol oxidase (also known as a mushroom tyrosinase) (see Benedict et al, page 7, in particular) as an enzymatic oxidizing agent; and optionally a non-enzymatic bifunctional crosslinking agent such as glutaraldehyde or DTSSP (see page 25 and 26, in particular; also as discussed, supra).

A composition such as claimed in which the non-enzymatic bifunctional crosslinking agent comprises a **quinone,** or in which the quinone is a **benzoquinone,** however, is not explicitly disclosed by Benedict et al (IDS).

Rae [C] teaches a method and a composition wherein using dihydroxybenzene and an effective amount of a suitable oxidation catalyst (or an oxidizing agent) produces highly reactive **1,4-benzoquinone**, *in situ,* which results in curing and crosslinking of the butyl rubber elastomers (CDB) at much lower temperatures such as 60° to 120° F (see

abstract, background of the invention, column 1, fifth paragraph and column 2-4, in particular). Rae [C] teaches the composition containing CDB elastomers with 1 to 6 % by weight of the 1,4-dihydroxybenzene and suitable amounts of oxidizing agent thereby oxidizing the 1,4-dihydroxybenzene to 1,4-benzoquinone in situ with the said benzoquinone curing said elastomer at room temperature or temperatures in excess of room temperature by formation of crosslinking moieties between elastomer polymer chains (see column 1, lines 37-52, in particular).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the adhesive composition comprising polyphenolic protein (or its derivatives) comprising a non-enzymatic bifunctional crosslinker (such as glutaraldehyde or DTSSP) as taught by Benedict et al (IDS) such that the non-enzymatic bifunctional crosslinking agent comprises a quinone, or a benzoquinone as taught explicitly by Rae [C].

The person of ordinary skill in the art would have been motivated to make such modification in the composition taught by Benedict et al (IDS) because Rae [C] teaches the benefits of using compounds in polymer compositions (such as synthetic rubber) which produce highly reactive intermediates such as benzoquinone during the process of curing resulting in oxidation-dependent polymerization through crosslinking initiated by such reactive quinines (see discussion, supra). One of ordinary skill in the art would be motivated to modify the adhesive compositions such as taught by Benedict et al by using quinine-based crosslinkers as they are extremely useful for the preparation of adhesive formulations that can effectively be crosslinked at room temperature (or mild

temperatures such as 60° to 120° F) as clearly demonstrated by the teachings of Rae [C].

One of ordinary skill in the art would have had a reasonable expectation of success when modifying the composition as taught by Benedict et al (IDS) because Rae [C] explicitly teaches the formulations comprising quinine-based compounds (see Rae [C], column 2, in particular) along with oxidizing agents which are effective in curing of the polymeric materials such as CDB elastomers at temperatures such as 60° to 120° F, and therefore being suitable for the adhesive compositions such as claimed in the instant invention.

Thus the invention as a whole would have been *prima facie* obvious to one skilled in the art at the time the claimed invention was made.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Satyendra K. Singh whose telephone number is 571-272-8790. The examiner can normally be reached on 9-5MF.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached on 571-272-0926. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Satyendra K. Singh

JEAN C. WITZ
PRIMARY EXAMINER